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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/677,052	10/01/2003	Joseph Hsieh	BELCO 3.0-001	8111

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EXAMINER	
JOHNSON, EDWARD M	

ART UNIT	PAPER NUMBER
1754	

DATE MAILED: 08/10/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

Office Action Summary	**Application No.** 10/677,052	**Applicant(s)** HSIEH ET AL.	
	Examiner Edward M. Johnson	**Art Unit** 1754	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *26 June 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *17-20,24-32,36-40 and 53-56* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *17-20,24-32,36-40 and 53-56* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Specification

1. Applicant is reminded of the proper language and format for an abstract of the disclosure.

The abstract should be in narrative form and generally limited to a single paragraph on a separate sheet within the range of 50 to 150 words. It is important that the abstract not exceed 150 words in length since the space provided for the abstract on the computer tape used by the printer is limited. The form and legal phraseology often used in patent claims, such as "means" and "said," should be avoided. The abstract should describe the disclosure sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details.

The language should be clear and concise and should not repeat information given in the title. It should avoid using phrases which can be implied, such as, "The disclosure concerns," "The disclosure defined by this invention," "The disclosure describes," etc.

2. The abstract of the disclosure is objected to because it is not drawn to the elected invention and is longer than a single paragraph. Examiner suggests deletion of "453633_1.DOC." Correction is required. See MPEP § 608.01(b).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the

> art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 17-19, 24-31, 36-40, and 53-56 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hwang '863 in view of Hwang '268, Gilbert, Jr. '057, Marlowe '648, and Vicard et al. US 6,294,139.

Applicant claims a method of controlling NOx emissions comprising: permitting flue gas to enter the interior of a chamber; quenching the flue gas to lower the temperature of the flue gas; injecting ozone into the interior of the chamber; and spraying a liquid towards the walls of the chamber to capture reaction products of the oxidation process.

Hwang et al. '863 discloses a process for the removal of impurities from gas streams. The flue gas is permitted to enter the interior of a chamber and ozone is injected into the chamber. Hwang et al. continues to disclose wherein an aqueous solution, such as sodium hydroxide may be added to treat the gas (see Figure 1, col. 3, line 65 - col. 2, line 43). Hwang et al. discloses wherein the liquid may be sprayed (col. 6, lines 49-61). However, Hwang et al. does not disclose quenching the flue gas to lower the temperature of the flue gas, as well as spraying the liquid towards the walls of the chamber.

Hwang et al. '268 teaches a process for the reduction of toxic substances in waste gas emissions. Hwang et al. '268 teaches wherein the gas stream is treated with ozone and an aqueous medium such as sodium hydroxide (see abstract and col. 3, lines 1-20). Hwang et al. '268 continues to teach wherein the hot gas stream is cooled, before ozone treatment (quenched; col. 6, lines 43-55).

Gilbert, Jr. teaches a process for removing nitrogen oxides from a gaseous mixture, which comprises contacting the mixture with an aqueous alkaline solution and injecting ozone (col. 4, lines 1-18). The sprayed liquid does hit the walls of the chamber (see Figs. 1 and 2), and the liquid flows downward and is directed to the bottom of the chamber through the center volume of the chamber. Therefore, Gilbert does teach spraying a liquid towards the walls of the chamber to capture reaction products.

Marlowe discloses a wet scrubber unit wherein a polluted air stream is emitted from an industrial plant or other source into a unit (interior of a reactor) and wherein water is sprayed to scrub the gas stream (col. 6, lines 1-47). Marlowe continues to disclose wherein a beam of water is directed towards the wall of the unit (col. 7, lines 11-19).

Marlowe fails to disclose maintaining a portion of the injection zone substantially free of droplets of the quenching liquid.

Vicard '139 discloses maintaining a portion of the ozone injection zone substantially free of liquid (see Figure).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to maintain a portion of the injection zone of the chamber "substantially" free of droplets of liquid, as in Vicard, in the NOx emissions control method of Marlowe because Vicard discloses the substantially liquid free zone in method for wet cleaning of nitrogen oxides (see abstract and column 1) which renders much more soluble oxidized pollutants (see column 2, lines 50-51) and Marlowe shows the liquid is to reflect and spray away from the center (see Figure), which would obviously, to one of ordinary skill, suggest maintaining the surface of the cylindrical inner duct within the chamber substantially free of liquid.

Therefore, it would have been obvious to one of ordinary skill in the art to modify the teachings of Hwang et al. .863, based on the teachings of Hwang et al. '268 by quenching the flue gas and spraying a liquid towards the walls of the chamber based on the teachings of Gilbert, Marlowe, and Vicard, since Hwang et al. '268, Gilbert, and Marlowe are all directed to processes for reducing pollutants in gaseous streams, wherein ozone is injected and wherein there is an aqueous alkaline solution wash or scrubbing procedure, wherein the flue gas is quenched and the spraying of the liquid is towards the walls of the chamber as taught by Hwang et al. '268, Gilbert and Marlowe, respectively. Such modification would have been obvious to one of ordinary skill in the art, because one of ordinary skill in the art, would have expected a process for reducing polluted gas streams using ozone and an aqueous solution as taught by Hwang et al. '268, Gilbert and Marlowe to be similarly useful and applicable to a process for treating nitrogen oxides using ozone and an alkaline solution as taught by Hwang et al. '863.

Since the instantly claimed process is similar to the process steps of the cited prior art, it would have been obvious to one of ordinary skill in the art to expect to maintain a droplet-free chamber interior, since the same process steps are taught in the prior art, with respect to claim 30.

With respect to claim 18, the cited prior art teaches sodium.

With respect to claim 19, see Figure 1 of Hwang et al. '863, the injection of ozone occurs below the spraying of the liquid and the entrance of the flue gas is below the spraying of the liquid based on Figure 1 of Hwang et al. '863.

With respect to claim 21, there is a 0.5 to 5 mole ratio between ozone and nitrogen oxide (col. 5, lines 30-33).

With respect to claims 22 and 23, Hwang et al. '863 discloses a residence time of about 0.5-15 seconds and a reaction time of 3 to 10 seconds (col. 4, lines 6-14).

With respect to claim 24, Gilbert, Jr. teaches the liquid having a flow rate of from 10 to 60 gallons per minute per 1000 cubic feet (col. 2, lines 40-42). Hwang et al. '268 teaches wherein up to 95% of the nitrogen oxides can be treated (col. 6, lines 12-22) and Gilbert, Jr. teaches wherein the level of nitrogen oxide concentration is lowered to about 30 ppm (col. 6, lines 15-20). The gas is cooled at 25 -125 Deg. C (col. 6, lines 43-50).

5. Claims 20 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hwang '863 in view of Hwang '268, Gilbert, Jr. '057, Marlowe '648, and Vicard '139 as applied to claims 17 and 30 above, and further in view of Skelley '002.

Applicant claims with respect to claims 20 and 32, wherein the step of injecting uses 3 or more spray nozzles. The teachings of Hwang et al. '863, '268, Gilbert, Jr., and Marlowe have been discussed with respect to claims 17-19, 24-31, and 36-40, but the cited prior art fails to disclose using 3 or more spray nozzles.

Skelley et al. teaches a process for removing nitrogen oxides from exhaust gases, which treats the gas with ozone and an alkaline aqueous solution. Skelley et al. uses more than 3 nozzles for spraying (see Figure 1, 92).

Therefore, it would have been obvious to one of ordinary skill in the art to modify the teachings of Hwang et al. '863, '268, Gilbert, Jr., and Marlowe based on the teachings of Skelley et al., which teaches uses more than 3 nozzles for spraying liquid.

Such modification would have been obvious to one of ordinary skill in the art, since Skelley et al. teaches a process for removing nitrogen oxides from exhaust gases, which treats the gas with ozone and an alkaline aqueous solution, and wherein the prior art also teaches a process for removing nitrogen oxides from exhaust gases, which treats the gas with ozone and an alkaline aqueous solution.

Response to Arguments

6. Applicant's arguments filed 6/26/06 have been fully considered but they are not persuasive.

Applicant's arguments with respect to the claims have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Edward M. Johnson whose telephone number is 571-272-1352. The examiner can normally be reached on M-F 9:30-6:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stanley S. Silverman can be reached on 571-272-1358. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Edward M. Johnson
Primary Examiner
Art Unit 1754

EMJ